Trend Study 16C-41-04

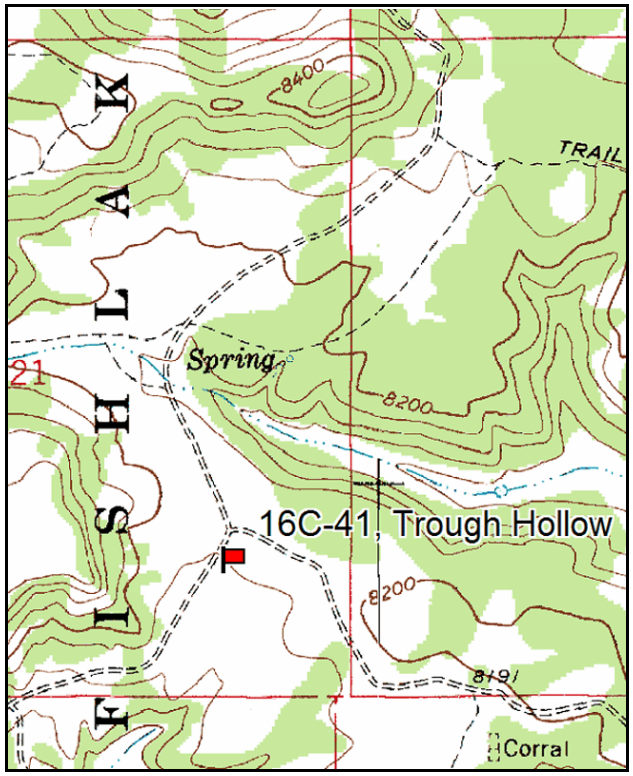
Study site name: Trough Hollow . Vegetation type: Mixed Mountain Brush .

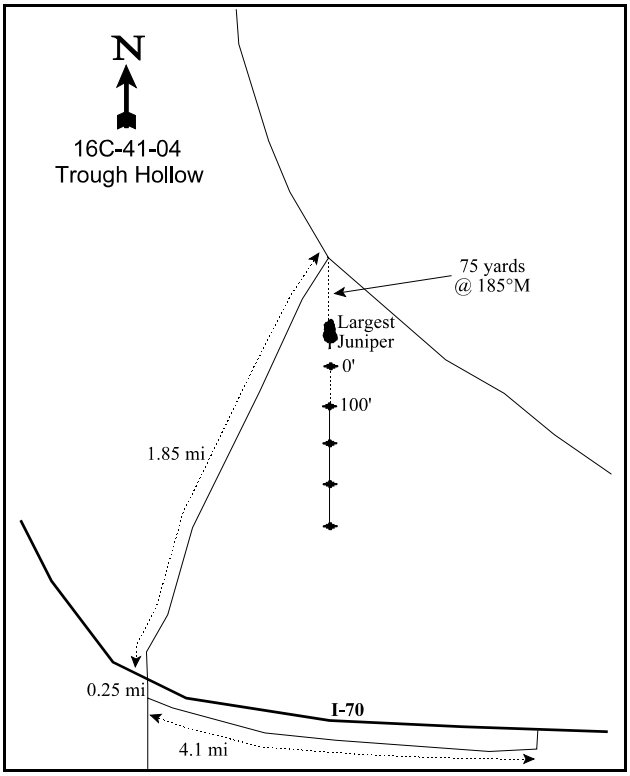
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Salina drive about 37.5 miles east on I-70 to a rest area exit. From the exit turn right and come back west on the frontage road paralleling the freeway for 4.1 miles to an intersection. Turn right on F.S. Road #011 and drive 0.25 miles to cross under the freeway. From the tunnel proceed 1.85 miles up and around a hill, then on to a major intersection. Stop here and look back at a bearing of 185 degrees magnetic to the largest juniper close to the road. It is about 75 yards from the intersection. Go back to this juniper to find the 0-foot baseline stake, 10 feet south of the tree out in the sagebrush flat. The stake is marked with browse tag #7192.





Map Name: Old Woman Plateau, Utah

Township 23S , Range 4E , Section 21

Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4293331 N, 459813 E

DISCUSSION

Trough Hollow - Trend Study No. 16C-41

This trend study, Trough Hollow, is found on the south end of the Old Woman Plateau at an elevation of 8,200 feet. The site is on a slight slope with a southern exposure. It samples an open area dominated by mountain big sagebrush. The range type is described as mixed mountain brush because of the great variety of desirable browse species. The area provides good year long habitat for deer, especially in spring and fall. Deer were seen near the study site in July of 1985, and fresh tracks crossed the transect. Pellet group data from 1999 estimate 31 deer, 53 elk and 38 cow days use/acre. Most of the deer and elk pellet groups appeared to be several months old, but about 20% of the elk pellet groups were from this spring. Pellet group data from 2004 estimate 19 deer, 9 elk, and 27 cow days use/acre (48ddu/ha, 23 edu/ha, and 66 cdu/ha). The area is quite popular for deer hunting and access is good on this part of the plateau. Grazing pressure is moderate and a deferred grazing system is used on the Beavers Dam allotment.

The soil is moderately deep and appears well developed. Effective rooting depth is estimated at almost 17 inches. Soil texture is a sandy clay loam with a neutral pH (6.9). There is very little rock in the soil profile or on the surface. Stoniness measurements are more a reflection of soil compaction since no rock was hit. A compacted clay horizon was encountered at a depth of about 10 to 12 inches. This does not appear to be a rooting barrier however. The ground is covered with a high percent of litter and vegetation with little bare soil exposed.

Mountain big sagebrush and bitterbrush are the key browse species on the site. Mountain big sagebrush provided 53% of the browse cover in 2004, while bitterbrush accounted for 33%. Density of mountain big sagebrush has remained fairly stable at 4,333 plants/acre in 1985 to 4,540 in 2004. The sagebrush population has good recruitment, light use, and good vigor. Percent decadence was high in 1985 at 45%, but it has remained steady at approximately 21% since 1991. Bitterbrush has shown consistent moderate to heavy use since 1985. Most of the population was classified as decadent in 1991, now these plants have since regained their health. Density was estimated at 1,932 plants/acre in 1985, 1,732 in 1991, 2,680 in 1999, and 2,060 in 2004. The bitterbrush population has good recruitment , excellent vigor despite use, and only 5% of the population was considered decadent in 2004. These plants display a spreading prostrate growth form, forming a secondary cover under the sagebrush.

Additional browse forage is provided by small numbers of serviceberry, rabbitbrush, woods rose, snowberry, and gray horsebrush. Density of serviceberry was estimated at 599 plants/acre in 1985, 599 in 1991, 600 in 1999, and 480 in 2004. Young recruitment was down this year and is the main difference in density estimates. They show moderate to heavy use and normal vigor. There are scattered clones of oak in the area, but they do not appear to be spreading.

There are many species of perennial grasses growing under and between the sagebrush, creating a fairly dense ground cover. The grasses were vigorous with light to moderate use when the study was established in 1985, but use of the grasses growing in the open was moderate to heavy in 1999 and 2004. The most common grasses are western wheatgrass, mutton and Kentucky bluegrass. Letterman needlegrass and slender wheatgrass decreased significantly in 2004. Forbs are diverse, but have a low abundance. Some provide highly palatable and preferred forage for deer, such as redroot eriogonum, penstemon, fleabanes, legumes, and dandelion. Utilization of forbs is generally light.

1985 APPARENT TREND ASSESSMENT

The soil is stable and improving as litter and dense vegetation give protection, add to the organic matter, and help build up the soil. The vegetative community appears stable at present. The great species diversity, and general health and vigor of the desirable species, contributes to the stability of the community. However, the

current rate of sagebrush reproduction may be inadequate to maintain the population in the future. Continued light to moderate use by both big game and livestock also tends to promote stability.

1991 TREND ASSESSMENT

Soil appears basically unchanged and stable, which could probably be considered an improvement with the drought conditions since 1989. There has been a decrease in litter, but with a corresponding increase in vegetative cover. Trend for the key browse species: serviceberry, mountain big sagebrush, and rabbitbrush are essentially stable with the exception of a slight decrease for bitterbrush. The principal species, mountain big sagebrush, has a slight decreased in it's population (3%), but percent decadency has gone from 45% down to 22%. This slight decrease in density would be expected from the extended drought. About half of the grasses sampled have increased nested and quadrat frequencies, especially western wheatgrass. Nested frequency of perennial forbs have increased slightly.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil continues to be stable. Ground cover characteristics have remained similar to 1991 levels. Trend for the key species, mountain big sagebrush and bitterbrush, is up slightly. Density of sagebrush is up slightly, use is lighter, and percent decadency has declined from 22% to 19%. Recruitment remains good with 21% of the population consisting of young plants. Bitterbrush has also increased slightly in density. Use is heavier but vigor improved and percent decadence has declined from 62% to only 1%. Some of the differences in density of sagebrush and bitterbrush may be due to the much larger sample used in 1999. Trend for the herbaceous understory is down slightly for grasses and down for forbs. Sum of nested frequency for perennial grasses and forbs has declined. Sum of nested frequency of western wheatgrass and mutton bluegrass have declined significantly while frequency of Kentucky bluegrass has increased significantly. Nested frequency of forbs has declined dramatically. The Desirable Components Index (see methods) rated this site as excellent with a score of 93 due to excellent shrub cover, many young shrubs, moderate decadence, and excellent grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 93 (excellent) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Protective cover remains high, while percent bare ground cover has decreased. Cryptograms have been present since 1985, but appear to absence in 2004. Soil erosion in minimal due to the extensive vegetation cover. Trend for key browse species is stable. Density has down slightly, but the majority of losses would be from the young age class. Percent decadence has increased from 19% in 1999 to 24% in 2004, but young recruitment remains fairly good. Bitterbrush populations has remained stable. Use is still heavy, but plants have maintained good vigor and recruitment is adequate. Trend for herbaceous understory is down slightly. Sum of nested frequency have decreased slightly for perennial grasses and forbs. Use by livestock remains moderate to heavy. Letterman needlegrass decreased significantly. Forbs remain diverse, but provide only a small percentage of vegetation cover mainly due to low growth form. The

Desirable Components Index (see methods) rated this site as excellent with a score of 82 due to excellent shrub cover, many young shrubs, moderate decadence, and excellent grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 82 (excellent) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 41

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron smithii	a99	b215	a91	a70	1.06	.94
G	Agropyron spicatum	-	-	-	1	-	.00
G	Agropyron trachycaulum	a-	b34	ab25	a5	.92	.06
G	Bouteloua gracilis	b12	b14	a-	a-	-	-
G	Bromus ciliatus	b16	a-	c66	b12	.71	.10
G	Bromus inermis	5	-	8	-	.04	-
G	Carex spp.	5	12	14	3	.24	.00
G	Festuca ovina	b13	a-	a-	a1	-	.03
G	Poa fendleriana	ab227	b214	a175	ab202	7.59	6.55
G	Poa pratensis	a13	b116	c166	d234	6.27	6.21
G	Poa secunda	-	4	-	3	-	.15
G	Sitanion hystrix	c162	b38	a13	a2	.20	.02
G	Stipa columbiana	2	3	6	-	.18	-
G	Stipa lettermani	b119	b105	b95	a38	2.16	.30
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		673	755	659	571	19.41	14.39
Total for Grasses		673	755	659	571	19.41	14.39
F	Agoseris glauca	a-	b76	a-	a1	-	.00
F	Antennaria rosea	a14	b29	ab12	ab26	.62	1.35
F	Androsace septentrionalis (a)	-	-	b64	a29	.41	.18
F	Arabis spp.	a-	ab4	b13	a-	.05	-
F	Astragalus convallarius	b113	a35	a18	a10	.16	.05
F	Aster spp.	4	-	-	-	-	-
F	Astragalus spp.	4	8	12	1	.22	.00
F	Castilleja chromosa	5	10	3	-	.06	-
F	Calochortus nuttallii	b90	ab148	a-	a2	-	.01
F	Chaenactis douglasii	-	-	2	-	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Cirsium wheeleri	3	4	2	3	.03	.03
F	Collinsia parviflora (a)	-	-	$_{a}$3	$_{b}$144	.01	.61
F	Crepis acuminata	$_{b}$12	$_{ab}$6	$_{a}$-	$_{a}$-	-	-
F	Erigeron caespitosus	10	-	-	-	-	-
F	Erigeron eatonii	$_{b}$105	$_{b}$96	$_{a}$23	$_{a}$25	.31	.15
F	Erigeron flagellaris	16	7	16	7	.13	.01
F	Erigeron pumilus	$_{a}$5	$_{ab}$14	$_{ab}$18	$_{b}$20	.50	.08
F	Eriogonum racemosum	112	122	88	99	1.36	1.33
F	Eriogonum umbellatum	9	6	19	13	.24	.80
F	Ipomopsis aggregata	5	-	1	-	.00	-
F	Lithospermum ruderale	-	3	-	-	-	-
F	Lupinus argenteus	8	2	8	1	.54	.03
F	Lychnis drummondii	-	-	3	-	.00	-
F	Machaeranthera canescens	-	-	2	-	.03	-
F	Microsteris gracilis (a)	-	-	-	7	-	.02
F	Oxybaphus linearis	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Penstemon palmeri	2	-	-	-	-	-
F	Penstemon pachyphyllus	5	11	1	-	.15	.00
F	Petradoria pumila	-	-	2	-	.00	-
F	Penstemon watsonii	$_{a}$5	$_{b}$29	$_{b}$21	$_{a}$4	.31	.04
F	Polygonum douglasii (a)	-	-	$_{a}$18	$_{b}$44	.04	.11
F	Senecio multilobatus	-	-	1	-	.00	-
F	Taraxacum officinale	23	15	26	11	.08	.03
F	Tragopogon dubius	-	3	-	-	-	-
F	Trifolium spp.	6	5	-	-	-	-
F	Unknown forb-perennial	$_{b}$34	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Vicia americana	$_{b}$18	$_{ab}$11	$_{a}$-	$_{a}$2	-	.00
F	Zigadenus paniculatus	$_{ab}$6	$_{b}$12	$_{a}$-	$_{a}$-	-	-
Total for Annual Forbs		0	0	85	224	0.46	0.92
Total for Perennial Forbs		626	656	291	225	4.86	3.97
Total for Forbs		626	656	376	449	5.32	4.89

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 16C, Study no: 41

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Amelanchier utahensis	25	19	.66	.66
B	Artemisia tridentata vaseyana	96	92	19.40	18.44
B	Chrysothamnus nauseosus hololeucus	0	4	-	.03
B	Chrysothamnus viscidiflorus viscidiflorus	37	50	1.11	1.74
B	Gutierrezia sarothrae	0	2	-	.18
B	Juniperus osteosperma	2	2	.38	.38
B	Mahonia repens	13	14	21.55	13.67
B	Purshia tridentata	71	72	10.40	11.54
B	Rosa woodsii	7	6	.49	.52
B	Symphoricarpos oreophilus	11	15	.45	.52
B	Tetradymia canescens	5	12	.06	.36
Total for Browse		267	288	33.16	34.69

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 41

Species	Percent Cover	
	'99	'04
Amelanchier utahensis	-	.36
Artemisia tridentata vaseyana	-	24.01
Chrysothamnus nauseosus hololeucus	-	.23
Chrysothamnus viscidiflorus viscidiflorus	-	2.88
Juniperus osteosperma	1.00	1.83
Mahonia repens	-	.40
Purshia tridentata	-	19.28
Rosa woodsii	-	.30
Symphoricarpos oreophilus	-	1.06
Tetradymia canescens	-	.35

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 41

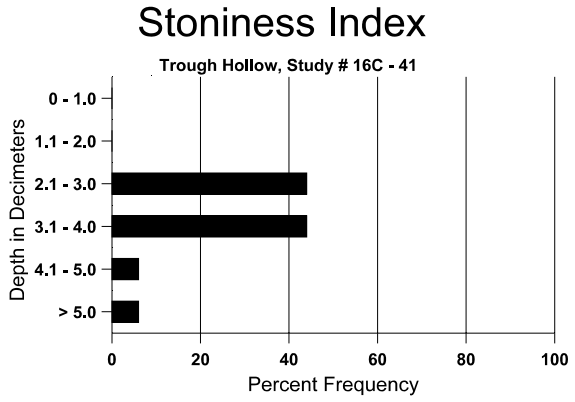
Species	Average leader growth (in) '04
Amelanchier utahensis	3.9
Artemisia tridentata vaseyana	2.4
Purshia tridentata	5.0

BASIC COVER --
Management unit 16C, Study no: 41

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	13.25	21.25	56.79	51.33
Rock	0	.50	0	.01
Pavement	0	.25	.21	.14
Litter	73.00	63.25	59.30	61.34
Cryptogams	.75	.25	.21	0
Bare Ground	13.00	14.50	13.29	11.04

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 41, Study Name: Trough Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
16.9	46.3 (12.7)	n/a	48.0	25.4	26.6	2.3	8.5	163.2	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 41

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'04	'99	'04
Rabbit	5	24	-	-
Elk	11	10	53 (131)	9 (23)
Deer	13	32	31 (77)	19 (48)
Cattle	7	10	38 (94)	27 (66)

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 41

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	**599**	66	533	66	-	-	33	0	0	-	0	10/15
91	**599**	-	400	66	133	-	33	11	22	-	0	21/13
99	**600**	-	280	320	-	-	27	33	0	-	3	20/18
04	**480**	-	40	280	160	-	17	50	33	8	8	16/17
Artemisia tridentata vaseyana												
85	**4333**	666	400	2000	1933	-	40	0	45	-	14	26/25
91	**4199**	133	800	2466	933	-	14	0	22	-	5	26/32
99	**5260**	520	1100	3180	980	540	4	1	19	3	3	35/42
04	**4540**	240	380	3080	1080	1120	16	.44	24	8	8	29/32
Cercocarpus ledifolius												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	33/27
Chrysothamnus nauseosus hololeucus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**220**	20	40	180	-	-	0	0	-	-	0	14/25
Chrysothamnus viscidiflorus viscidiflorus												
85	**1800**	-	600	1200	-	-	0	0	0	-	0	5/8
91	**2266**	-	1800	466	-	-	21	0	0	-	3	4/9
99	**2120**	-	120	2000	-	-	0	0	0	-	0	8/11
04	**2280**	20	20	2240	20	-	0	0	1	-	0	9/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**60**	-	-	60	-	-	0	0	-	-	0	7/9
Juniperus osteosperma												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	40	-	-	-	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Mahonia repens												
85	**1666**	-	266	1400	-	-	0	0	-	-	0	3/3
91	**333**	533	333	-	-	-	0	0	-	-	0	-/-
99	**2080**	-	520	1560	-	-	0	0	-	-	0	2/4
04	**1420**	20	200	1220	-	-	0	0	-	-	0	2/4
Purshia tridentata												
85	**1932**	200	400	1466	66	-	45	21	3	-	0	19/28
91	**1732**	-	400	266	1066	-	23	23	62	7	23	9/19
99	**2680**	80	660	1980	40	-	14	68	1	-	0	21/38
04	**2560**	120	380	2060	120	-	13	66	5	.78	.78	19/40
Rosa woodsii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**620**	-	280	340	-	-	0	0	-	-	0	11/8
04	**580**	-	300	280	-	-	0	0	-	3	0	8/8
Symphoricarpos oreophilus												
85	**733**	200	533	200	-	-	0	0	0	-	0	9/10
91	**932**	-	400	466	66	-	36	0	7	-	0	9/14
99	**580**	20	280	300	-	-	3	0	0	-	0	18/22
04	**520**	-	80	360	80	-	0	0	15	4	4	14/18
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**120**	-	-	100	20	-	0	0	17	-	0	8/7
04	**280**	-	80	180	20	-	0	7	7	7	7	8/12